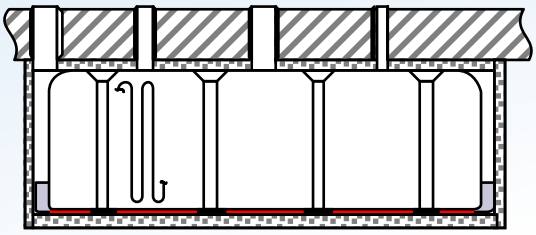
Liquid Nuclear Waste Facilities

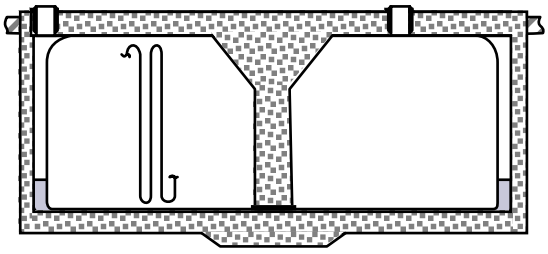
Liquid radioactive waste is generated at the Savannah River Site (SRS) as byproducts from the processing of nuclear materials for national defense, research and medical programs. The waste, totaling about 37 million gallons, currently is stored in 45 underground carbon-steel waste tanks grouped into two "tank farms" at SRS.

TANK FARMS — THERE ARE FOUR TYPES OF WASTE TANK DESIGNS:



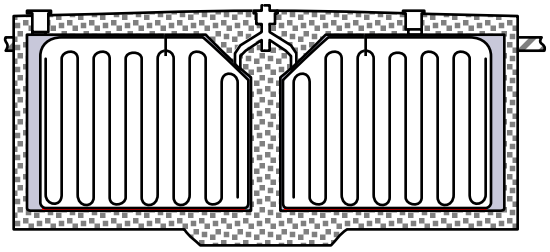
Type I Tanks

- 12 Type I tanks were built between 1951-53
- 750,000 gallon capacity; 75 feet in diameter by 24 ½ feet high
- Partial secondary containment with leak detection
- Contain approximately 10 percent of the waste volume
- 7 Type I tanks have leaked waste into the tank annulus; the amount of waste stored in these tanks is kept below the known leak sites that have appeared over the decades of operation, and there are no active leak sites
- 2 Type I tanks were operationally closed and grouted



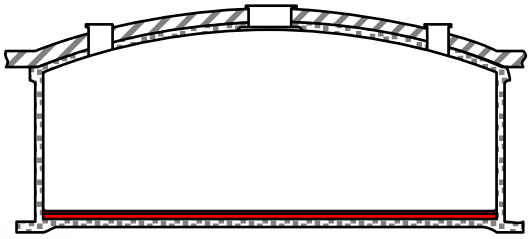
Type II Tanks

- 4 Type II tanks were built between 1955-56
- 1 million gallon capacity; 85 feet in diameter by 27 feet high
- Partial secondary containment with leak detection
- Contain approximately 3 percent of the waste volume
- 4 Type II tanks have leaked waste into the tank annulus; the amount of waste stored in these tanks is kept below the known leak sites that have appeared over the decades of operation, and there are no active leak sites



Type III Tanks

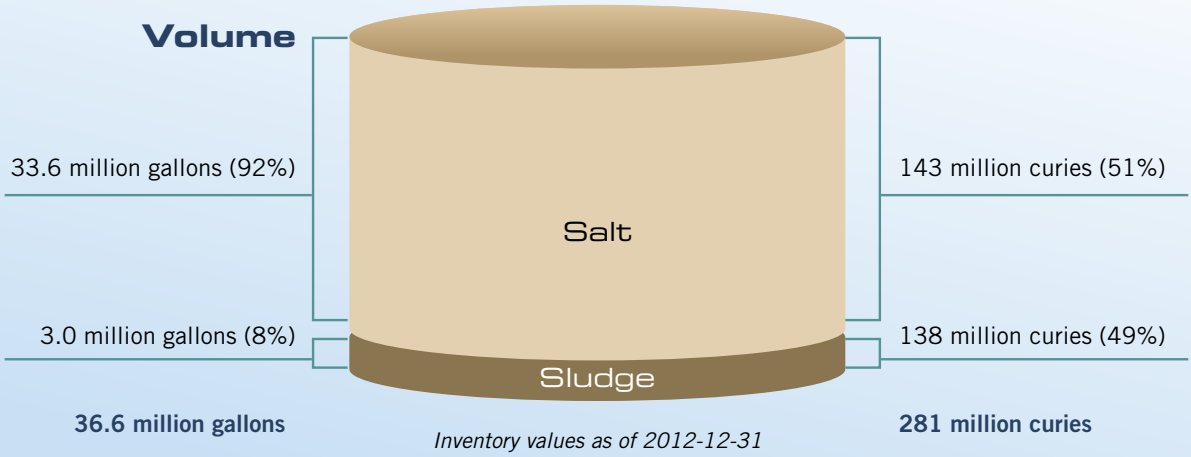
- 27 Type III tanks were built between 1967-81
- 1.3 million gallon capacity; 85 feet in diameter by 33 feet high
- Most modern tank farm design at SRS, including heat stress relief on the tank walls to prevent cracking
- Full height secondary containment with leak detection
- Contain approximately 76 percent of the waste volume
- No Type III tanks have leaked



Type IV Tanks

- 8 Type IV tanks were built between 1953-63
- 1.3 million gallon capacity; 85 feet in diameter by 34 feet high
- No secondary containment
- No active leak detection system
- Contain approximately 11 percent of the waste volume
- 4 Type IV tanks were operationally closed and grouted

The Type I, II and IV tanks do not meet current secondary containment requirements set by state regulators and will be emptied and closed first in accordance with a federal agreement.



Inventory values as of 2012-12-31

EVAPORATORS

While the waste is stored in the tanks, a sludge settles on the bottom of the tank and a liquid salt waste resides on top of the sludge. The waste is reduced to about 30 percent of its original volume by evaporation. The condensed evaporator "overheads," or water removed from the waste, are transferred to the Effluent Treatment Facility for final cleanup prior to release to the environment. As the concentrate cools, a portion of it crystallizes, forming solid salt waste.

SRS CURRENTLY HAS TWO EVAPORATORS OPERATING

2H Evaporator, located in H Area

- Single-stage, bent-tube design
- Began operating in 1982

3H Evaporator, located in H Area

- Single-stage, bent-tube design
- Began operating in 2000

DEFENSE WASTE PROCESSING FACILITY

The Defense Waste Processing Facility (DWPF), located in S Area, immobilizes the radioactive waste sludge by vitrifying it into a solid glass waste form.

- The sludge and borosilicate glass "frit" are mixed together forming melter feed for the DWPF melter.
- The sludge/glass mixture is fed to a melter and heated to approximately 2,100 degrees Fahrenheit (1,150 degrees Celsius).
- The molten glass is poured into stainless steel canisters to cool and harden.
- Each canister is 10 feet tall and 2 feet in diameter.
- The canisters are sealed, decontaminated on the outside, welded shut and stored onsite in a building designed for safe interim storage until a Federal repository is available.
- DWPF has poured more than 3,670 canisters since processing radioactive sludge began in March 1996.

SALT WASTE PROCESSING

Removing salt waste, which fills over 90 percent of the usable tank space in the SRS tank farms, is a major step toward emptying the Site's remaining 45 high-level waste tanks that contain approximately 37 million gallons of waste.

Interim Salt Processing

Interim salt waste processing facilities have been developed that integrate a set of salt-decontamination steps designed to eliminate nearly all of the radioactive isotopes from about 21 million gallons of salt solution until the Salt Waste Processing Facility (SWPF) becomes operational, which is targeted for 2018.

This interim salt processing is being performed in two facilities, both initiating operations in April 2008.

- Actinide Removal Process (ARP)

ARP removes radioactive contaminants, such as plutonium and strontium, by adding a chemical that attaches itself to the radioactive particles and can then be filtered out. The radioactive portion is transferred to DWPF, where it is mixed with molten glass and poured into 10-foot-tall stainless steel canisters which will be welded shut and temporarily stored until they can be shipped to an off-site federal repository. The remaining filtered salt solution is then sent to Modular Caustic Side Solvent Extraction Unit.

- Modular Caustic Side Solvent Extraction Unit (MCU)

Using principles involving centrifugal force and a special engineered solvent, MCU divides the high-activity salt solution into two waste streams. The cesium is removed and sent to DWPF. The remaining decontaminated salt waste solution is transferred to the Saltstone Production Facility to be mixed with dry cement-like materials to form a grout for safe, permanent disposal in engineered vaults.

Salt Waste Processing Facility (SWPF)

The Salt Waste Processing Facility (SWPF) will process the majority of the Site's salt waste inventory. SWPF will treat highly radioactive salt solutions currently stored in underground tanks at SRS and prepare these solutions for ultimate disposition. SWPF will use processes similar to those found within ARP and MCU, but on a larger scale.

SWPF will separate key high-activity radionuclides from the low-activity salt waste using proven separation technologies of filtration and centrifugal contractors. After separation, the high-activity salt waste will be vitrified at DWPF and poured into canisters, which will be temporarily stored onsite until a Federal repository is chosen. The remaining high-volume/low-activity salt waste will be treated and disposed of by the Saltstone Production Facility. This dual-track approach reduces the number of DWPF canisters to be filled and the facility's associated lifecycle costs.

Lessons learned from ARP and MCU processing experiences are evaluated and factored into the design and operation of the SWPF.

Saltstone Facility

The Saltstone Production Facility treats and permanently disposes of low-level liquid waste by stabilizing it in a solid, cement-based waste form.

- Liquid waste is combined with a dry blend of cement, slag and fly ash.
- The resulting mixture is referred to as "grout."
- The grout is pumped to above-ground engineered Salt Disposal Units, where it solidifies into "saltstone."
- Saltstone is a non-hazardous waste form.

This facility has been modified to accommodate higher radioactivity levels in support of the interim salt processing strategy.

EFFLUENT TREATMENT FACILITY

The Effluent Treatment Facility, located in H Area, treats the low-level radioactive wastewater that was formerly sent to seepage basins in accordance with a State regulatory permit. Treated streams include evaporator overheads, segregated cooling water, contaminated surface water runoff, transfer line catch tank streams and others.

- Began operating in 1988
- Processes approximately 10 million gallons of wastewater per year
- Treatment processes include pH adjustment, filtration, organic removal, reverse osmosis and ion exchange
- Treated waste water streams are released to a permitted outfall

CLOSING WASTE TANKS

Ultimately, the current inventory of the waste in the tanks will be removed, and the old-style tanks operationally closed. The U.S. Department of Energy, S.C. Department of Health and Environmental Control, U.S. Environmental Protection Agency, Nuclear Regulatory Commission, SRS workers and the public are working closely together to implement strict closure requirements that support all state and federal regulations for tank closure.

Closure activities begin years before the actual closing of the tanks.

Safely closing waste tanks involves an intricate set of steps that includes emptying the waste tanks of bulk waste, then removing as much of the remaining residual waste as practical through various technologies and techniques, and demonstrating that the closure is protective of human health and the environment.

Once those steps are complete, the tanks can be filled with grout, a cement-like material created especially for these waste tanks. This grouting process is designed to secure the tank and protect the environment.

Thirteen of the remaining 45 waste tanks are in the closure sequence.